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ABSTRACT

Five studies were aimed at furthering understanding of the effects of second language immersion on young children. The first study demonstrated that the neuropsychological test profile of children who are unable to make satisfactory progress when immersed in a kindergarten second language program is different from that of children with more "traditional" learning disabilities, and that the learning-disability profile of the immersed group was distinguishable from that of other groups. A second study confirmed these results and demonstrated that the neuropsychological deficits in question were no longer found after nine years of age. A sample of children was assessed at the end of the first and second years of kindergarten and of grade 1. These three assessments indicated that it was possible to identify with 100% accuracy, based on the first year's assessment, the children who would drop out of French immersion for academic reasons. The best predictors were the individual neuropsychological measures. The test findings support the interpretation of the first two years' studies that attributes the failure of young children (with no apparent disabilities) to succeed in immersion programs to a mild maturational lag, which does not affect normal progress in education in the vernacular. (Author/JB)

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Primary French Immersion: Disabilities and Prediction of Success

Ronald L. Trites

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Preface

The material contained in this monograph is a summary of five years of research supported under contract by the Ontario Ministry of Education. The author is extremely grateful not only for the financial support but also for the consistent interest and helpful advice given by Ministry personnel. The author has been assisted throught the full five years of investigation by Mrs. Anne Price. Mrs. Price had the major responsibility for maintaining contact with the many school personnel, parents, and children in the program and contributed substantially to the organization of the vast amount of information gathered. Without her diligent efforts, consistently high level of interest, and excellent ability in gaining the constant co-operation of parents, children, and school personnel this project would likely not have been completed. Although most of the material in this monograph is largely a condensation of the five reports already submitted to the Ministry of Education, some additional material has been extracted from a book to be published by University Park Press entitled Second Language Learning in Children, by Ronald L. Trites and Anne Price.

I. Purpose of the Study

The series of five studies summarized in this monograph began with a concern over the lack of understanding as to why some children experience great difficulty or fail when immersed in a second-language program at school beginnning at the five-year-old Kindergarten level. Primary French immersion was introduced in Ottawa schools in 1969-70 and by 1973 an increasing number of children who were experiencing learning difficulties in the French program were being referred to the Neuropsychology Laboratory at the Royal Ottawa Hospital for assessment. A review of the research literature revealed that virtually nothing was known about the characteristics of young children who are unable to progress satisfactorily when immersed in a second-language program at school. The problem became especially perplexing when it became evident that most of the children in Ottawa who were referred for assessment were bright, of normal or higher intelligence, came from relatively advantaged socio-economic backgrounds, were motivated to learn, and performed well on a variety of perceptual, language, motor and sensory tests.

With contractual research support from the Ontario Ministry of Education, and with tremendous co-operation from the various boards of education in the Ottawa area--particularly the Ottawa Board of Education, in which most of our studies were conducted--a two-year investigation into the nature of the learning difficulty in Primary French immersion was conducted. The results of these studies are presented in section III. Based on the study of a large number of children with learning disabilities in immersion, the findings of which were cross-validated in an independent study conducted in the second year, a well-defined and unique maturational lag was postulated as underlying the second-language learning difficulty. This interpretation was strongly enhanced by the results of a careful follow-up of all the children involved, the results of which are also presented in section III.

Once it became clear that those children who experienced great difficulty in Primary French immersion had a unique test profile, a three-year early-identification project was conducted in the Ottawa Board of Education schools, again under contract by the Ontario Ministry of Education. The goal of this investigation was to develop a battery of tests that could be administered to children in four-year-old Kindergarten to predict their ability to progress satisfactorily if immersed in a French-language program beginning in five-year-old Kindergarten. The results of this investigation are reported in section IV. As will be seen in that section, the early-identification battery proved to be highly accurate in predicting not only whether or not a child would succeed in French immersion, but also the level of success among those children who remained in the French-immersion program.

It is a fact that an appreciable number of children who are bright, come from advantaged socio-economic backgrounds, are motivated, and who in sum appear to possess all of the attributes necessary for a high level of academic success actually do not progress well in Primary French immersion. It is also a fact that it is possible to identify these children at four years of age - that is, before they are enrolled in a Primary French-immersion program. It is obvious that an appropriate early-identification battery should be used on children in four-year-old Kindergarten. Section V presents a brief summary of the results, a summary description of the features that should be included in an early-identification assessment, and specifically, suggestions for the use of this early-identification battery in different populations of children entering Primary French-immersion programs. Additionally, the potential uses of this assessment with other groups - for example, in determining the readiness of young Francophone children to learn English or the readiness of immigrant children, for whom English is a second language, to enter an English-language program at schools - is discussed.

The following section, by way of introduction to the study, presents a review of the pertinent literature.

II: A Review of the Literature

In the Primary or early-French-immersion program, English-speaking children are exposed to French as the exclusive language of instruction in Kindergarten and Grade 1, with instruction in the English language being introduced and gradually increased in later grades.

At present, there is contradictory evidence regarding the success of early-immersion programming as a means of instilling proficiency in a second language without having a detrimental effect on native-language skills. We will examine the studies that found a favourable outcome for immersion programming first and then look at the research that discovered negative aspects in immersion programming.

Studies Reporting Success With Early Second-Language Immersion

One study supporting immersion programming was conducted in the St. Lambert area of Montreal. Lambert and Tucker (1972) compared the linguistic, intellectual, and attitudinal development of English-speaking children in French immersion from Kindergarten through Grade 4 with that of English-speaking children in regular English classes as well as French-speaking children in regular French classes. In general, the results of this investigation indicated that French-immersion programming results in satisfactory proficiency in the French language for English-speaking children, without detrimental effects either to English-language skills or to progress in other academic areas. However, the experimental nature of this program, coupled with the way in which the children were selected (the French-immersion classes contained only the most capable children from an upper-middle-class area) and the tremendous parental involvement in and commitment to the program, may have contributed to the substantial success reported.

Further investigations, which followed the children in the St. Lambert French-immersion program through Grade 5 (Lambert, Tucker, and D'Anglejan 1973) Grade 6 (Bruck, Lambert, and Tucker 1976) Grade 7 (Bruck, Lambert, and Tucker 1975), and Grade 8 (Bruck, Lambert, and Tucker 1975) corroborated the success of French-immersion programming. In addition, the results of a preliminary study of children from working-class, English-speaking homes who participated in a French-immersion program in Kindergarten and Grade 1 suggested that the program was also suitable for that sample of children (Tucker, Lambert, and D'Anglejan 1972).

Another group of studies (Barik and Swain 1974, 1975a, 1975b, 1976a, 1976b) compared samples of children in French-immersion classes and regular English classes on measures of intelligence, achievement in reading and arithmetic, and French comprehension. Attempts were made to follow the same children from Kindergarten through Grade 3, but the sample differed at each grade level. The results indicated that French-immersion programming did not have negative effects upon cognitive development. English-language skills lagged slightly in Grade 1 for French-immersion children, but this was overcome in Grade 2, with the exception of spelling skills in some samples, after English language arts had been introduced. In the 1973-74 evaluation in the Ottawa area, French-immersion children lagged in the development of English-language skills at both the Grade 1 and Grade 2 levels, but had also caught up to the English-program sample by Grade 3 (Barik and Swain 1974). These children also displayed adequate progress in arithmetic and in French comprehension. These results were interpreted as attesting to the general success of French-immersion programming. However, children with hearing, perceptual, or related problems were excluded from the testing, and no information was provided regarding drop-outs from French immersion or children who did not do well. In addition, the IQ level of children in French immersion in Grades 2 and 3 was significantly higher than it was in Grade 1 (Barik and Swain, 1976a, 1976b), suggesting that the children with lower IQs may have dropped out.

Edwards and Casserly (1971, 1972, 1973) followed samples of children in French-immersion programs as well as children in the English program who were instructed in French for seventy-five minutes per day, from Grade 1 through Grade 3. These children were compared on measures of personality, achievement in arithmetic, language skills in English and French, visual, auditory, and kinesthetic functioning, psycholinguistic abilities, and intelligence. The children in French immersion did as well as the children in the English program in all areas, with the exception of a lag in their English-language skills in Grade 2, which was overcome in Grade 3 after the introduction of English language arts. The French-immersion children showed greater progress in French as compared to the group instructed in French for seventy-five minutes per day. A number of characteristics of children in these two programs were considered. Some personality differences were found, and it was noted that children with intellectual, learning, language, or environmental handicaps were encouraged to remain in the seventy-five-minute program. In summary, the results of this study supported intensive second-language training. However, it was suggested that preselection factors might have favoured the French-immersion sample, since the French-immersion and seventy-five-minute program samples differed in language and Kindergarten background.

Genesee (1978) evaluated children in an early-immersion program in the Protestant School Board of Greater Montreal. The children were followed from Grade 1 through Grade 6 and were compared with children in the regular English program and to Francophones in regular French schools. Children in the French-immersion program lagged in the development of English-language skills until the introduction of English language arts. However, they continued to have difficulty with English spelling until the Grade 5 level. Students with below-average ability had lower achievement levels than their academically stronger peers in French immersion. However, their level of achievement in English was comparable to that of students of below-average ability in the English program.

With regard to the follow-up studies of early-French-immersion programming in Canada reported to date, several cautionary notes should be made. It is of considerable importance that there is clearly some degree of attrition in the number of children who continued in the French-immersion program. Very rarely did these studies include a clear statement as to either the number or percentage of children who dropped out of the program, or to their reasons for dropping out of the program. In the St. Lambert area of Montreal, twenty of the original twenty-six children in the pilot French-immersion class were still in the program by Grade 5 (Lambert et al. 1973) and only fifteen by Grade 7 (Bruck, Lambert, and Tucker 1976). Of the thirty-eight children in the French-immersion follow-up class, thirty were still in the program by Grade 4 (Lambert et al. 1973) and only twenty-five by Grade 6 (Bruck et al. 1976). However, their reasons for dropping out were not mentioned. Edwards and Casserly (1973) gave more details regarding drop-outs. Between Grades 1 and 2, there was a 20 per cent decrease in enrolment. Between Grades 2 and 3, there was a further 16 per cent decrease. The reasons cited for these drop-out rates were vague, for example: (a) leaving the school system; (b) transferring to the English program or to the seventy-five-minute French program because of inability to handle immersion; (c) transportation reasons.

In addition, the follow-up French-immersion studies did not consider the children who had difficulty in French-immersion programs. There was also a tendency towards selectivity in the choice of subjects. Edwards and Casserly (1973) suggested the possibility that preselection factors favoured the French-immersion sample. Barik and Swain (1974) eliminated certain children from their analysis, such as "pupils whose teachers indicated [that they] had special problems (for example, serious hearing or vision difficulties, emotional problems); pupils whose teachers indicated had a very limited ability to understand and express themselves in English".

Thus, there are clearly some important unresolved questions regarding the outcome of the French-immersion program. The favourable results

reported may be based in part on biased samples. Little is known about the failures or the children who experience difficulty in the immersion program. It is important that efforts be made to define the characteristics of the marginally successful and failing students as well as the successful ones.

Studies Reporting Failures With Early Second-Language Immersion

The above studies are unique in view of the fact that early-immersion programming has not met with success in several countries. In Ireland, English-speaking children, for whom the language of instruction in school was Irish, did not achieve the same standard in written English as English monolinguals, or in written Irish as Irish monolinguals. The Irish-immersion children also experienced retardation in arithmetic problem-solving skills but not in simple arithmetic computations (MacNamara 1966).

Jones (1966) reported that English-speaking children taught in Welsh were below English monolinguals in English reading. A slight positive correlation was found between favourable attitudes towards learning Welsh and Welsh achievement. Conversely, if parents' attitudes towards learning Welsh were negative, their children did poorly in this program.

In South Africa, it was observed that bilingual children taught in their mother tongue showed no adverse emotional reactions, but if children of lower intelligence were taught in the language with which they were less familiar, emotional disturbances could result (UNESCO 1975).

Modiano (1968) found that children in Mexico whose native tongue was Tzeltal or Tzotzil, but who were given reading instruction in Spanish only, scored significantly lower on Spanish reading tests than children who were taught to read in their native tongue first and in Spanish later.

In the United States, there has been much attention directed towards the progress of Spanish-speaking children attending English-language schools. In general, children in this English-immersion program have not achieved competence in the English language comparable to that of English monolinguals and have had poor academic success (MacNamara 1966; Gezi 1974). In response to the failure of this immersion approach, bilingual-education programs have been set up in which instruction begins in the vernacular and moves gradually towards English. Improved academic success is observed among children in programs that offer "initial" instruction in their mother tongue (Gezi 1974).

Engle (1975) reviewed twenty-four reports concerned with the use of the vernacular language in education. She raised two questions: "1. Will a child learn to read more rapidly in his second language if he is first taught to read in his primary language? 2. Will the child achieve greater general knowledge of other subject matters if he is taught these subjects first in his native language?" Engle concluded that no definitive answers to these questions could be drawn, since the reports varied in many ways and there were many confounding factors.

Variables Affecting Second-Language Learning

Irrespective of the manner in which a second language is introduced, considerable interest has been shown in individual differences in second-language acquisition. This section presents a review of several of the variables thought to affect second-language acquisition. Two of the factors most often cited as important determinants of success in second-language learning are: (a) linguistic aptitude, and (b) attitudinal variables (Barkman 1969; Jones 1966; Gardner and Lambert 1959; Pimsleur et al. 1962; Stern 1967; Mackey 1967). Little is known about differences in language aptitude among children below age nine or ten; however, by these ages there is clear evidence that children vary in aptitude for foreign-language learning (Carroll 1969).

The view of Penfield (1965) that a child can best learn a second language before the age of twelve to fourteen years (i.e., before the functional connections of the uncommitted cortex become fixed) had been used in support of early immersion. Others disagree that young children have a greater capacity for learning a foreign language than do adults and suggest that the advantages of an early start are in the lack of self-consciousness and longer period of study rather than in the capacity of the learner (Carroll 1969). The question of the optimal age to introduce a second language is still open to debate. In Canada, late-French-immersion programs at the Grades 8 and 9 levels appear to be quite successful in advancing linguistic competence in French without persistent detrimental effects to English-language skills or to subject matter taught in French (Barik and Swain 1967c). As yet, however, early-/and late-French-immersion programs have not been compared systematically to determine their relative advantages and disadvantages.

Favourable attitudes towards the second language and the second-language community seem to facilitate second-language learning (Mackey 1967; Jones 1966; Gardner and Smythe 1973). Secondary school students whose aim in second-language learning is integrative (i.e., who wish to learn a second language in order to interact with, communicate with, and become a part of the second-language community) are reportedly more successful in learning the second language than are students whose aims are utilitarian or instrumental - for example, to increase employment opportunities (Gardner and Lambert 1959; Lambert 1974). In addition, the latter group tended to drop out of Secondary school French courses more often than did the first group (Garnder and Smythe 1973). English-speaking children in Wales, whose parents resented Welsh as the medium of instruction in school, did poorly in immersion programming (Jones 1966).

Sociological factors, such as the relative prestige of the first and second languages (Paulston 1974) and the learner's perceptions and beliefs about the other ethnolinguistic group (Lambert 1974), have been

cited as possible factors affecting the success of early-immersion programs. These factors may be important in explaining the seemingly contradictory results with early-immersion programs in different countries.

The level of biological maturation has been stressed by some as an important determinant of success in second-language learning. Penfield (1953, 1965) was an influential figure in promoting the view that young children are the best language learners. He stressed speaking, understanding speech, reading, and writing depend on certain specialized areas of the cerebrum, and that there is an optimum age when these areas are plastic and receptive. In his view, functional localization of skills is established by ages ten to fourteen, so that specific areas of the cortex become fixed as the speech cortex. Penfield (1965) held that second-language teaching, using the "mother's method" of direct language teaching should begin before the age of six or eight so that the childs' brain will be conditioned early, thus making him or her a better linguist. Much of this theory was based on clinical evidence that, following damage to the dominant hemisphere, children below age ten or twelve recovered speech functions, some by establishing a speech centre in adjacent areas of the cortex or even in the previously non-dominant hemisphere.

Lennenberg (1967) has also promoted this view by suggesting that there is a critical period for language acquisition, which ends at puberty. This cutoff point is marked by a loss of cerebral plasticity, thought to be caused by the completion of the development of cerebral dominance, or lateralization of language function. Lennenberg supported his lateralization-by-puberty hypothesis by citing evidence that right-hemisphere injuries cause more language disturbance in children than in adults, indicating greater right-hemispheric involvement in language functions during childhood; in addition, the transfer of language function to the minor hemisphere after injury to the dominant hemisphere was reported to occur only before puberty. There is, of course, abundant evidence to argue against this (e.g., Bramwell 1898). Accor-

ding to Lennenberg, such transfer was seen to be related to incomplete lateralization, since it utilized the linguistic capacities of the right hemisphere, which have not fully lateralized to the left hemisphere.

The conclusions of Penfield and Lennenberg, however, have been challenged. McLaughlin (1977) provides an excellent review of issues related to second-language learning in children. He points out that, contrary to popular belief, "older children do better on almost all aspects of language acquisition than do younger children in comparable circumstances". Phonological aspects are a possible exception, with younger children having less difficulty than older ones in acquiring native-like pronunciation. Lennenberg's critical-period hypothesis is thus shown to be doubtful.

Krashen (1973, 1975) also challenged the relationship between lateralization and a critical period for language acquisition. He suggested that the development of language is complete before puberty, perhaps at age five. He reviewed Lennenberg's data of 1967 and pointed out that the injuries cited in support of lateralization-by-puberty occurred before age five and could be used to support the lateralization-by-five hypothesis. Some testing data, including dichotic-listening test results, were cited in support of this earlier age level. Krashen claimed that completion of lateralization does not pose an absolute barrier to language acquisition, and, in fact, evidence is coming forth that suggests that lateralization may even be established at birth (Molfese 1974). Thus, cerebral dominance is not responsible for the critical period of language acquisition. However, lateralization may be implicated in that language learning may depend on the previous maturation and lateralization of certain mental abilities localized in the left hemisphere.

Although it is not paricularly germane to the discussion here, it should be mentioned that the study of brain organization in bilinguals has not been restricted to a consideration of age factors. For

example, brain-stimulation studies have demonstrated that larger areas of the brain seem to be devoted to language in bilinguals (Ojemann and Whitaker 1978) and that perhaps languages are even more bilaterally represented in the brain in bilinguals than in monolinguals (Albert and Obler 1978).

Age changes in language-learning ability have been related to cognitive development. Tremaine (1975) found that children aged seven to ten in a French-immersion program showed a dramatic improvement in their comprehension of both French and English syntax once they had reached Piaget's stage of concrete operations (age seven or eight to ten or twelve). It was suggested that comprehension of the English and French requires the same abilities needed for certain types of concrete operational thought. In addition, children in French immersion comprehended English syntax significantly better than did children receiving seventy-five minutes of instruction in French daily. It was proposed that intensive exposure to French facilitated comprehension of English syntax because the same maturational abilities were involved. This facilitation was possible because the children were in an intermediate stage when concrete operations and, presumably, syntactic comprehension were trainable.

Rosansky (1975) examined cognitive factors possibly related to a critical period for the acquisition of language. The onset of Piaget's stage of formal operations was seen as "the beginning of the end" of the critical period for first-or second-language acquisition. Formal operations are established at about age fourteen or fifteen, corresponding to the age at which second-language learning is reported to be difficult and usually incomplete. Rosansky suggested that the awareness of differences, which characterizes the stage of formal operations, may be a block to second-language acquisition. The child learns language alongside of other symbolic functions beginning in the sensori-motor period. During the stage of concrete operations (age seven or eight to eleven or twelve) comprehension of the logic of classes and relations characterizes cognitive structures. During this

stage, the child is limited to being able to focus on the underlying similarities of languages. In terms of this view, once the stage of formal operations is established, the student's awareness of differences and all possibilities requires that language learning be accomplished by a different route than that followed previously. At this level, instruction in the abstractd aspects of language of which the adult is aware becomes the likely route for second-language acquisition.

These investigations of language learning in relation to cognitive development are potentially important. However, as yet the available evidence is tentative.

As mentioned earlier, many disagree that adults lose an innate capacity for language learning or that they are less well equipped cognitively than children for second-language learning. Schumann (1975) suggested that affective variables are more important than biological maturation in problems associated with adult second-language learning. Social and psychological changes at puberty may interfere with second-language learning (e.g., students at this stage may associate "different" with "bad", or may be unwilling to internalize new norms). If affective variables such as attitude, motivation, and empathy are positive, cognitive processes are allowed to work and second-language learning is successful. Smythe, Stennet, and Gardner (1976) listed children's lack of self-consciousness, lack of fixed patterns, additional time in second-language learning, and motivation as factors facilitating their second-language learning and denied the superiority of children as foreign-language learners. Burstall et al. (1974) found that older children (age eleven) tended to learn French more efficiently than younger ones (age eight) when it was taught for short daily period. They noted that some able students found learning French difficult because they found the emphasis on oral learning without the support of visual cues intolerable. Preference for the auditory rather than the visual mode may be related to second-language learning. Catford (1971) cited different circumstances (e.g., occupational pressures, time

constraints), rather than the loss of an innate capacity, as accounting for adults' less-successful language learning. MacNamara (1975) views first- and second-language acquisition as the same process and cites evidence from studies to show that adults are better than children in some aspects of second-language learning.

Thus, the debate continues. It does not seem to have been determined unequivocally that young children are indeed better language learners than are older children or adults. Nor is it clear to what extent biological maturation, cognitive development, or affective and situational variables are involved in success at second-language learning at different age levels.

Variables Affecting Success in French-Immersion Programs

A few studies have considered specific descriptive or test variables as they relate to performance in French-immersion programs. Performance levels on IQ tests have received some attention. Dockrell and Brosseau (1967) investigated the relationship of chronological age, mental age, and attitude to three measures of French achievement (vocabulary size, pronunciation, and comprehension) among forty children in French-immersion Kindergarten. The older subjects showed greater improvement in vocabulary size and comprehension and less improvement in pronunciation than did the younger ones. Attitude measured in an interview was related to all aspects of French achievement, while an attitude questionnaire was related only to vocabulary size. General intelligence was correlated with vocabulary only, and not with comprehension or pronunciation. This correlational analysis did not give a clear picture of the factors affecting second-language learning or of the underlying complexity of such relationships.

Genesee, Allister, and Morin (1974) reported that IQ levels were related to the level of performance on tests of the formal aspects of French for pupils in a late-French-immersion program. However, IQ was not related to listening and speaking in French. The English-language skills of children in Grade 4 of an early-immersion program and of

children in Grade 7 of a late-immersion program were investigated in relation to IQ differences (Genesee, 1974a). The children were divided into three IQ groups: above-average (116 or above), average (96 to 115), and below-average (95 or below). At each grade level, these three IQ groups differed significantly on six measures of English writing skills, with the above-average group rated highest, followed by the average and below-average groups. These finding suggest that IQ differences are related to success in French immersion in terms of some aspects of French-language skills and of English-language skills in both early- and late-French-immersion programs.

In addition to IQ and related scores, personality test scores have received some attention as they relate to success in French immersion. A comparison of Grade 2 children who dropped out of French immersion with Grade 2 children who remained in French immersion indicated that the drop-outs were more assertive and tense (Alexander, Hallows, and Tiltens 1974).

Edwards and Casserly (1976) compared Grade 2 French immersion and Grade 2 English pupils on the Early School Personality Questionnaire. The immersion group tended to be more assertive and independent, as well as more critical and abstract in their thinking. These differences were attributed to "preselection factors affecting the parents' choice of a second language option for their child". Grade 3 French-immersion children differed from regular-English-program pupils on several personality characteristics as measured by the Early School Personality Questionnaire (Edwards and Smyth 1976). There was evidence of greater anxiety among the French-immersion group on one measure. In general, these comparisons have failed to find consistent personality differences between pupils in French immersion and the regular English program, suggesting that different preselection factors are likely at work.

Swain and Burnaby (1976) compared children in French immersion and the regular English program on nine personality traits as rated by their

Kindergarten teachers. Immersion-program children were rated as happier, as having more perfectionist tendencies, and as being more talkative. These were considered to be traits that parents view as important for success in French immersion. The nine personality characteristics were also correlated with measures of French-language achievement in Kindergarten, Grade 1, and Grade 2. Characteristics of quickness in grasping new concepts and perfectionist tendencies correlated significantly most frequently with second-language scores.

Tucker, Hamayan, and Genesee (1976) investigated personality characteristics of Grade 7 pupils using the Junior-Senior High School Personality Questionnaire. One group had been in French immersion since Kindergarten, while the other group had been in a regular English program before Grade 7 French immersion. The personality characteristics important for success in learning French differed in these programs. Children in the one-year, late-French-immersion program were most successful in listening comprehension and oral production if they were adventuresome and attempted to use French in the community.

The Myklebust Pupil Rating Scale (1971) was completed by French and English teachers for pupils in French immersion and in the regular English program from Grade 1 to Grade 4 (Edwards and Casserly 1976; Edwards and Smyth 1976). There were no consistent significant findings, but French and English teachers did tend to rate the children differently.

Children With Learning Disabilities in French Immersion

Some children experience difficulties when they are immersed in the early grades in a second-language program. An early study in Montreal (Bruck, Rabinovitch, and Oates 1975), focused on the effects of French-immersion programs on children with language disabilities. The investigators concluded that these children fare well, in that they learn to read in both English and French. They also concluded that the children's first-language acquisition did not appear to have been

retarded by their placement in a French-immersion program. However, there were several serious methodological difficulties with this study, including the fact that the conclusions were based on an extremely small sample of subjects, basically a sample of three to six children depending on the date of follow-up.

In a later study, Bruck (1978) examined the suitability of Primary French immersion for the language-disabled child. The achievement levels of children with language disabilities and of normal controls enrolled in Primary French immersion were compared with those of children with language disabilities and of normal controls enrolled in the regular English program. The progress of the children was followed from Kindergarten to Grade 3. Bruck (1978) concluded that "children with language-learning problems who attend French immersion programs can develop linguistic, cognitive and academic skills at a rate similar to that at which they would develop were they placed in an all-English classroom". She concluded that children who encounter difficulty in French immersion should remain in the program and receive remedial assistance in the French language. However, the validity of these conclusions must be viewed with caution. The language-disabled children in the English program had a significantly lower performance-IQ scores in Kindergarten and in Grade 3 compared with the language-disabled children in the French-immersion program. Non-verbal aspects of cognitive functioning may influence which children remain in French immersion and which children transfer out of the program. The problem group in French immersion had the highest attrition rates of all groups and the children who remained in the program to Grade 3 likely represent a select, more-able group compared to the problem group in the English program. Trites and Price (1977) found that the children who transferred out of the French-immersion program had a lower verbal IQ and were experiencing a greater degree of academic difficulty than were children who remained in French immersion in spite of difficulties. Thus, one must consider that the groups compared by Bruck (1978) may not have been disabled to the same extent and that the more-disabled children did not remain in the French-immersion program to the end of

the longitudinal study. In addition, the progress of the problem groups in English reading tended to be at or above grade level. This suggests that the initial diagnosis of language disability are questionable. It should also be noted that progress in the French language of problem children in French immersion was measured up to the Grade 3 level by a test appropriate for Grade 1 children. The scores at Grades 2 and 3 may represent ceiling effects.

Second-Language Learning and Reading

Controversy exists over the advisability of introducing reading in the second language to a child before he or she learns to read in the native tongue. Downing (unpublished paper) has suggested that the mismatch between home and school language causes retardation in the development of reading skills. Studies cited earlier pointed to the retardation of reading skills in both the first and second language when the child was taught to read initially in the second language (MacNamara 1966), to the retardation in native-language reading skills when initial reading was taught in a second language (Jones 1966), and to improved reading ability in the second language when the child was taught to read initially in the vernacular (Modiano 1968). Miller (1973) also pointed out the importance of the match of home and school environments for success in reading. Gezi (1974) reviewed studies of bilingual and bicultural education and stressed the importance of the native tongue as a medium of instruction.

In contrast, studies of the reading skills of children in French immersion in Canada indicated that their reading levels in French were below those of French monolinguals, but that any retardation in English-language skills is overcome with the introduction of formal English reading instruction. Swain (1974) has suggested that it is easier to read in French than in English because the former has a more systematic sound-symbol correspondence. The basics of reading are then easily transferred, since the vocabulary and language structures are already established. However, contradictory findings regarding reading

achievement in English arise when one compares children in partial-French-immersion programs, who are taught to read in English initially, to children in total-French-immersion programs, who are taught to read in French initially. Swain (1974) reported that one group of children in a partial-French-immersion program were better readers in English in Grades 1, 2, and 3 than children in a total-French-immersion program who had not had any English language arts instruction; however, Grade 2 or Grade 3 children in a total-French-immersion program who had received one year of English language arts instruction could read as well in English as children in the same grade in a partial-French-immersion program. Both immersion groups had lower English reading test scores than Grade 2 or 3 children in the regular English program. Thus, in this sample, learning to read in the vernacular did not appear to enhance reading skills. In contrast, another group of children in a partial-French-immersion program, who were taught to read initially in English, did appear to have enhanced reading skills in English. Children in a Grade 3 partial-immersion class were better readers in English than children in a total-French-immersion program regardless of the grade at which English language arts were introduced. With regard to reading skills in French, being taught to read initially in French appears to promote better reading skills in French, since children in total French immersion outperformed children in partial French immersion on French reading tests. However, when comparisons were made on the basis of amount of exposure to French, partial-immersion programs appeared to produce levels of proficiency in reading French comparable to the reading levels achieved by children in total-French-immersion programs. Both immersion groups were poorer readers in French than French monolinguals.

Tucker (1975) reported that for pupils in Grade 1 and Grade 2 French-immersion programs, reading achievement in French was a good predictor of reading achievement in English at each grade level. The apparently easy transfer of reading skills from French to English was stressed.

McDougall and Bruck (1976) investigated the effect on native-language

skills when initial reading instruction was in the second language and when native-tongue instruction was introduced at different grade levels - that is, Grade 2 (early) or Grade 3 (late). The French-immersion students were in Grades 3 and 4 when tested. The early and late English reading groups did not differ in English reading as measured by the Spache Diagnostic Reading Scales, nor did they differ from children in the regular English program. The authors concluded that a great amount of knowledge must be transferred from French to English and that this transfer is accelerated in the case of the group receiving English reading beginning in Grade 3. French reading levels were not compared. These results emphasize good progress in English reading following initial reading instruction in French. However, these results should be considered with caution. Only one measure of reading achievement was employed. As well, the formal introduction of English reading in Grade 3 does not necessarily reflect the actual amount of experience the children had in reading in English. They were from middle-class homes where parents probably encouraged and supported the development of native-tongue literacy (Tucker 1975). The longer formal English reading instruction is delayed, the more likely it is that these parents would take an active role in promoting these skills.

Cziko (1976) examined reading achievement in both English and French among Grade 4 children in different school programs. The groups included one in early French immersion (children in French immersion from Kindergarten); one in late French immersion (children who were in a regular English program until Grade 4, when they entered French immersion); one in a regular English program; and one in a regular French program. There were no significant differences among the first three groups in English reading. The late-immersion group did as well as the early-immersion group in French reading. French and English reading ability were positively correlated. The authors concluded that neither early nor late French immersion has detrimental effects on English reading and that there is a good transfer of reading skills across languages. However, there was no evidence of greater transfer from French to English than from English to French. The reading test

data did not indicate any advantages from an earlier start in learning French on French reading skills. Nor was there evidence that reading instruction in the vernacular initially enhanced reading in the vernacular or in the second language. The possible influence of parents upon the native-tongue language skills of French-immersion children may have influenced these results.

In addition to the contradictory evidence from studies comparing children in total-French-immersion programs who are taught to read in French initially with children in partial-French-immersion programs who are taught to read in English initially, studies reporting difficulties in other settings are of interest. Cowan and Sarmed (1976) compared the performance of Persian-speaking children in English immersion or in a bilingual (50-50) English-Persian program with Persian-speaking and English-speaking children on measures of reading in English and Persian. The children in the immersion and bilingual schools were inferior to monolinguals in reading both Persian and English, especially Persian. The English-immersion program did not produce higher reading levels in English compared to the bilingual (50-50) program, which failed to enhance reading skills in either language despite the use of the vernacular. Reading in both languages was suppressed in both the immersion and bilingual programs in contrast to the Canadian results (e.g., Lambert and Tucker 1972).

There is evidence that the simultaneous introduction of reading in two languages may cause confusion. Cohen, Fathman, and Merino (1976) compared Spanish-speaking children educated in an English school with those in a Spanish-English bilingual program on measures of reading in English and Spanish. By Grade 5, the English school children surpassed the bilingual-program children on measures of English reading while the reverse was true on measures of Spanish reading. The poor performance by bilingual school children on English reading was attributed to the simultaneous introduction of reading in the two languages by the same teacher.

In view of contradictory evidence, further investigation of this problem is needed and, as yet, no definitive statement can be made regarding the optimal sequencing of initial reading instruction in bilingual educational programs (Engle 1975). Tucker (1975) discussed the conflicting results of studies on the sequencing of reading instruction in the vernacular and the second language. He claimed that initial teaching in the vernacular failed to affect pupils' performance in some studies in contrast to others because several factors influenced native-tongue development in children receiving initial reading instruction in their second language. These, he said, included the existence of a vernacular literary tradition, the encouragement of native-tongue literacy by parents and the community, the similarity of orthographic representations, and the structural similarity of the two languages.

Late-French-Immersion Programs

Children entering French immersion at the Grade 4 level do not differ at the end of the school year from Grade 4 children who have been in French immersion since Kindergarten on measures of English and French reading achievement (Cziko 1976).

Late-French-immersion programs beginning at the Grade 8 level appear to be quite successful in advancing linguistic competence in French without persistent detrimental effects to English-language skills or to subject matter taught in French (Barik and Swain 1976c). However, the bilingual group was highly select in terms of IQ, general academic ability, and motivation.

Genesee (1974) examined the English writing skills of both early- and late-French-immersion groups. These groups consisted of Grade 4 and Grade 6 children who had begun total French immersion in Kindergarten, and Grade 7 and Grade 11 children who had entered French immersion beginning Grade 7. Neither the early- nor late-immersion children demonstrated difficulty expressing themselves in English at any level.

Thus it appears that even when French immersion is introduced at later levels, native-language skills are not adversely affected.

Genesee, Allister, and Morin (1974) reported that the students in the pilot Grade 7 late-French-immersion class followed through Grade 11 experienced no harmful effects on their native-language skills while their French-language skills were considerably better than those of children following the traditional French-as-a-second-language course. Although preliminary findings suggest that late immersion is a viable and effective alternative to early French immersion, this systematic evaluation needs to be continued before conclusions can be drawn.

Bruck, Lambert, and Tucker (1976) compared students in Grade 7 of early-/and late-French-immersion programs. The children in the early-immersion program had entered French immersion in Kindergarten. The children in the late-immersion program had attended only one year (i.e., Grade 7) in an immersion program. In this study, the authors replicated a study they had conducted in 1975, which had yielded contradictory results in that early-immersion students had higher levels of French achievement at the Grade 8 level than did late-immersion students. However, at the Grade 7 level, the late-immersion students were found to have equal or higher levels of achievement in French. In the replication of this study reported in 1976, Bruck, Lambert, and Tucker found that, at the Grade 7 level, the early-immersion students showed higher levels of achievement than the late-immersion students on tests of reading, writing, speaking, and listening in French. However, it was noted that the students entering the late-immersion program were a highly select group, having higher IQ levels than the students in the early-immersion program. Thus, while students in late immersion were successful in acquiring French-language skills, the viability of late immersion for all children (e.g., those of low or average IQ) remains an open question.

Swain (1978) summarized the results of evaluations of three alternative programs for teaching French-/to English-speaking children - namely, an

early-French-immersion program, an early-partial-French-immersion program beginning in Grade 1, and a late partial-French-immersion program beginning in Grade 8. It was suggested that children in all three programs recovered in terms of English-language skills in spite of an initial lag in this area and developed French-language skills to a higher level than did their peers in regular English programs studying French as a second language. A cloze test of French-language skills was administered to children in Grade 6 of a total-French-immersion program, to children in Grade 7 of an early-partial-French-immersion program, to children in Grade 13 of a late-partial-French-immersion program, and to Francophones in Grade 6 and Grade 13. Swain concluded that, although the pupils in Grade 13 of the late-partial-French-immersion program scored second highest, next to the Grade 13 Francophones, the early-total-French-immersion program produces students who have a more native-like command of French than do the other two programs. She bases this conclusion on the comparison of peer groups - that is, the Grade 13 French-immersion students scored six points below the Grade 13 Francophones while the Grade 6 total-French-immersion students scored only two points below Grade 6 Francophones. However, Swain does not indicate that IQ was measured and controlled in these comparisons. Since French-immersion groups frequently have higher IQ scores than English and French comparison groups, the comparisons presented as evidence of the superiority of early-total-French-immersion programs to early-/or late-partial-immersion programs are not convincing.

Shapson and Kaufman (1978) evaluated the French-language achievement of students enrolled in a Grade 8 late-Franch-immersion program in British Columbia. The French-immersion group performed better on French tests than did Grade 8 and Grade 12 students following the traditional French-as-a-second-language program. The authors concluded that late French immersion is a feasible option for secondary school students who have not attended an early-French-immersion program. However, the progress of the students in late French immersion was not compared to the progress of children in early French immersion nor to that of Francophones.

Specific Neurological Substrates of Language Learning

Factors other than IQ, attitude, personality type, and age at which a second language is introduced must be considered in attempting to understand the progress or lack of it in an individual child in a second-language learning program. One factor that obviously must be considered is the adequacy of the functioning of the brain regions subserving language processes. The brain areas strongly implicated in language learning are the temporal lobes. Not only does this brain region contain the auditory cortex, but the temporal lobes have been implicated in verbal and non-verbal auditory processing and memory functions. Important studies dating back over twenty years (Kimura 1961; Milner 1954, 1958) have demonstrated the effects on psychological functions of damage or dysfunction in temporal-lobe regions. The deficits in learning associated with disturbances of temporal-lobe function are not restricted to gross alterations of behaviour, but may include difficulty in learning verbal associations and deficits in the delayed recall of verbal and non-verbal material (Dimond 1972). The right and left temporal lobes subserve different psychological functions: impairment of the left temporal lobe often leads to deficits on verbal tests; dysfunction in the right temporal lobe is more likely to lead to non-verbal visual-symbolic perceptual and memory deficits. The obvious psychological nature of the functions subserved by the temporal lobes, and more specifically the verbal and auditory components, give this brain region a high profile when a neurological model of language learning is considered.

This review has presented data and opinions on many aspects of second-language learning in children. It is clear that immersing children in a second language at an early age has met with considerable success in some settings, but with far less success in others. In addition to the age at which the language is introduced, and the way it is introduced, research studies indicate that factors such as language aptitude, stage of cognitive development, affective variables, attitudes, and other factors are also important to consider. We have also seen that an

understanding of brain maturation, structure, and function may play a particularly important role in understanding more about second-language acquisition in young children. Since little work has been done in attempting to understand the difficulties some children have in learning a second language at an early age, we made this our first research goal.

III: A Two-Year Investigation of Specific Learning Difficulties in Primary French Immersion.

One of the services offered in the neuropsychology laboratory at the Royal Ottawa Hospital is a detailed examination of children with learning disabilities. Children referred to the laboratory are given a six- to eight-hour examination on tests, which have been standardized in Ottawa in French and English (Trites 1977), to determine the type of learning difficulty they may have and to help in assessing the cause for this disability. The test battery, described more fully later in this section, includes a variety of tests of psychometric ability, academic achievement, reasoning skills, language development, auditory perceptual functions, visual motor functions, motor tests, and sensory tests, as well as various personality and behavioural screening devices. Over 4000 children from the Ottawa region have been assessed on this extensive battery of tests, with reassessments over time, as was mentioned earlier.

French-immersion programs began in the Ottawa schools in 1969-70 with programs at the Kindergarten level. It had become apparent by 1973 that increasing numbers of children were being referred to the laboratory for examination. Most of the children had important deficiencies in their school progress, despite at least average intelligence and no evidence of brain dysfunction. Also, in general, these children could not be readily classified as having dyslexia, other types of perceptual or learning disabilities, or "minimal cerebral dysfunction". It was considered possible that if these children had been in an English-language program, their progress through school might have been uneventful. The remainder of this section describes the results of a two-year investigation into the unique learning-difficulty profile of children who have difficulty in Primary French immersion as compared with those having "traditional" types of learning difficulties such as primary reading disability, minimal brain dysfunction syndrome, emotional maladjustment with learning difficulty, and hyperactivity with learning difficulty.

The two-year investigation was funded under contract by the Ontario Ministry of Education, and detailed reports of the findings were published (Trites and Price 1976, 1977). Only a summary of the findings are presented here, and the reader should consult the original reports for an extensive description of the methodology, statistical analysis, special parent and teacher questionnaires used, test profiles, and other findings.

Sample

The aim of the first study was to compare the neuropsychological test profile of children with learning disabilities in Primary French-immersion programs with those of other groups of children who have learning difficulties. The subjects were selected from among children who were referred for testing to the neuropsychology laboratory of the Royal Ottawa Hospital. A total of 256 carefully selected children were chosen for study, all of whom were referred for problems of learning difficulties in school. Eight groups, each composed of thirty-two children, were formed. Thirty-two children who were in Primary French immersion, but who had either switched to an English-language program or were experiencing difficulty in French immersion, were matched as closely as possible with seven comparison groups in terms of age and sex. In three comparison groups, language was a factor, namely:

1. Anglophones in Francophone schools. For these children, as for the French-immersion group, the home language was English and the classroom language was French. However, in this instance, the total school was French and the child was not in a specialized program for Anglophone children such as is the case with the French-immersion program.

2. Children from other ethnic backgrounds in Anglophone schools. For this group the home language was something other than French or English. It included children from German, Italian, Dutch, Polish, Chinese, and other language backgrounds.

3. Francophones in Francophone schools. This was a group of thirty-two French-speaking children who were attending French schools and experiencing difficulty.

In addition to these three groups, four "traditional" problem groups were composed, each consisting of thirty-two children. In all cases, second language was not a factor, since these were English-speaking children attending English-speaking programs. These groups included:

1. Children with a primary reading disability. These were children who met all the criteria of primary reading disability, in that, although they were having serious problems in reading and related language-arts skills, they showed average intelligence or greater, no evidence of gross psychopathology, no gross neurological disturbance, and adequate motivation and opportunity.

2. Children who were hyperactive. These were children who met the standard criteria of hyperactivity, including Conners' Parent and Teacher Rating Scale scores of over 1.5, and physician's diagnosis of hyperactivity, substantiated in the neuropsychology laboratory. To be included in this group the child also had to have a learning difficulty.

3. Children with behavioural and/or personality adjustment problems. These were children diagnosed by a psychiatrist as having adjustment problems along with test evidence of a learning disability.

4. Children with "minimal cerebral dysfunction". These children were diagnosed by a neurologist and/or pediatrician as having minimal cerebral dysfunction, usually based on physical neurological examination and mild or moderate EEG abnormality.

The above four comparison groups in which language was not a factor were carefully composed. These groups were included to determine whether children who had difficulty in French immersion resembled in

important ways children who might be expected to have difficulty in school in any event. For example, if it was found that the profile of the French-immersion learning-difficulty group and the reading-disability group were similar, then it could be concluded that the French-immersion learning-difficulty group would likely have had difficulty in school in any event, particularly insofar as the development of reading and spelling skills are concerned.

Procedure

Extensive history information including birth history, developmental milestones, medical and neurological history (including exact records where applicable, such as EEG recordings, details of use of drugs such as Ritalin, etc.), social and emotional development, family relations, and school performance was obtained on each of the 264 children in the study. History information in each case was obtained from parents, school authorities, social agencies, and physicians. In addition, each child received an extensive six- to eight-hour neuropsychological examination (Trites 1977) that included the Wechsler Intelligence Scale for Children (Wechsler 1949), Peabody Picture Vocabulary Test (Dunn 1965), Halstead-Reitan Tests (Trites 1977), Wisconsin Motor Steadiness Battery (Trites 1977), Frostig Visual Perceptual Battery (Frostig, Lefever, and Whittlasey 1966), Illinois Test of Psycholinguistic Abiulity (Kirk, McCarthy and Kirk 1968), Knox Cube Test,. (Arthur 1947) and tests for lateral dominance (Trites 1977) academic achievement (Jastak and Jastak 1965), personality (Coan and Cattell 1972), and parent and teacher ratings (Conners 1969, 1970; Myklebust, 1971).

Descriptive Data

The means and standard deviations for age, Full Scale IQ based on the Wechsler Intelligence Scale for Children, and sex distribution of the groups are presented in Table 1.

Table 1: Age, WISC FSIQ, and Sex of the Eight Groups

Groups	Age		WISC FSIQ		Sex	
	Mean	S.D.	Mean	S.D.	Males	Females
French immersion	7.0	1.2	104.3	10.6	22	10
Anglophones in Francophone schools	8.2	1.7	97.7	12.5	26	6
Ethnic groups in Anglophone schools	8.0	1.5	95.3	13.7	24	8
Francophones in Francophone schools	8.4	1.1	94.0	10.7	27	5
Reading disability	8.3	1.0	104.8	8.5	22	10
Hyperactive	7.2	1.7	101.3	9.7	30	2
Behaviour and personality problems	7.8	1.1	101.8	11.5	24	8
Minimal brain dysfunction	7.8	1.6	96.9	10.2	21	11

It can be seen from Table 1, with respect to the comparison between the French-immersion group and all other groups, that the children in this group tended to be younger and have a higher Full Scale IQ than all but the reading-disability group.

Analysis and Results

As mentioned earlier, extensive information, including academic, teacher rating, family background, psychological-test, and other information, was carefully recorded on all thirty-two children in each of the eight learning-difficulty groups. The primary focus of this first year of study was to determine if the characteristics of children failing in immersion were unique to that group or were similar to the kind of learning difficulties seen in children from other groups such as the group of children with primary reading disability. The uniqueness of the profile for each of the eight groups was tested by pooling all of the children together and then determining if, by statistical-classification methods alone, the children could be accurately classified back into their proper groups. This was done to an extremely high level of accuracy. It was thus possible to conclude at the outset that the pattern of learning difficulties was unique in each of the eight groups, which was quite a remarkable finding. The fact that the French-immersion children were significantly differentiated from stringently defined control groups who also experienced difficulty in school gave strong support to the hypothesis that these children form a unique group in terms of test profile. Unique factors seem to be operating in their learning difficulty as a group and their learning problems cannot be considered to originate from such problems as dyslexia or primary reading disability, hyperactivity, minimal brain dysfunction, or behavioural and personality adjustment.

When the test and academic-social background profile of the French-immersion group was compared to each of the seven learning-disability groups singly, it was determined even more clearly that the French-immersion group had a unique profile of strengths and deficits. Overall, the French-immersion group was composed of young, bright, and highly motivated children who gave no evidence of difficulty on basic motor and sensory tests. They stood out among the groups as having a well-developed vocabulary in English. However, a most important finding from the eight-group analysis was that the French-immersion group had significantly poorer performance levels on the Tactual

Performance Test (TPT) (Trites 1977) than all groups except Anglophones in Francophone schools and the minimal brain-dysfunction group. The fact that the French-immersion group performed at poorer levels, similar to the brain-dysfunction group, on this measure is of considerable interest. The TPT is a complex psychomotor problem-solving task in which the child, while blindfolded, is required to place six or eight blocks, depending on age, of varying shapes and sizes into a form board, first with the dominant hand, then with the non-dominant hand, and finally with both hands together. The time required for each of the three trials is recorded. Following completion of this task, the blindfold is removed and the child is required to make a drawing of the board and blocks from memory, attempting to keep them in the correct spatial position. Adequate performance on this task is dependent, among other things, upon integrity of the temporal-lobe regions of the brain. It is known that the temporal lobes are important brain structures in language and auditory-perceptual functions. The poorer performance of the French-immersion group cannot be considered as related to motor or sensory deficits since their performance was well within normal limits on these measures. The importance of the psychomotor problem-solving deficit will be discussed further in the next section.

Several of the thirty-two children in the French-immersion group were reassessed in the laboratory on one or more occasions following their transfer to an English-language program. Their progress, as measured on English-language tests of reading, spelling, and other language-arts skills, indicated a general acceleration of their academic progress to normal levels for age and grade placement (Trites and Price 1976, 1977).

Discussion

In this investigation, the eight-group discriminant-function analysis and the series of two-group discriminant-function analyses indicated that a significant number of children could be classified correctly in their groups on the basis of their neuropsychological test profiles.

These findings substantiate the view that children who experience difficulty in early French immersion have a unique test profile and are distinctive in terms of the factors contributing to their learning difficulty.

The French-immersion learning-difficulty group was characterized by high IQ, excellent motor and sensory functions, and yet had the poorest performance of all the groups on a complex psychomotor problem-solving test (TPT). Clinical interpretation of performance levels on this test can be complex, but under certain stringent conditions (adequate motivation, adequate intelligence, no evidence of severe motor or sensory disability, no gross psychopathology) performance on this test has specific implications with regard to the adequacy of the functioning of the temporal lobes. It is well established in the neuropsychological literature that the temporal lobes are important brain structures for subserving language, memory, and auditory-perceptual functions. This finding could be interpreted to mean that children who have experienced difficulty in Primary French immersion are a unique group in the sense that they are not, as a group, hyperactive and do not, as a group, have characteristics of primary reading disability, "minimal cerebral dysfunction" or personality problems. Rather, this group has a distinctive learning difficulty characterized by a pattern of deficits that are considered here as indicative of a maturational lag in the temporal-lobe regions of the brain.

The results of this study strongly contradict the widely held belief that the ideal time to introduce a second language for all children is at an early age. The findings suggest that for some young children, even if very bright, a second language should not be introduced until a later age. The results also strongly support the conclusion that children who do poorly when immersed in a second language at an early age would not have had learning difficulties if they had been taught in their native language. There was a clear indication that these children do not have primary reading disabilities or other types of language or perceptual difficulties that would impair their progress in a regular school program.

Cross-Validation Study

The specific difficulty found in the French-immersion learning-difficulty group in the first study was possibly open to bias on the basis that all the children in it had been referred to a clinic for investigation of their learning problems. The remaining part of this section presents results of a cross-validation study that avoided the possibility of that bias and, importantly, aimed at discovering the validity of the results of the first study and at gathering further information bearing on the maturational-lag hypothesis. This study was conducted during 1976-77 (Trites and Price 1977).

Sample

For cross-validation purposes on a non-clinic sample, children who had dropped out of the Primary French-immersion program of a school in the Ottawa board were selected as follows. The names of sixteen children who had dropped out ~~of~~ the program in the school years from 1971 to 1976 were obtained from the principal. The permission of the children's parents was then obtained to include the children in the study. A control group of sixteen children who had remained in the French-immersion program at the same school was formed. The control children were matched with the drop-outs on the basis of age, sex, and having been in the same French-immersion Kindergarten class. It was considered important that the drop-out and control French-immersion students had shared the same teacher in order to minimize teacher variability. The descriptive information for the two groups is presented in Table 2.

Table 2: Descriptive Information for the Drop-Out and Control Groups

	Drop-Outs	Control
Number	16	16
Age: Average	8.6	8.7
SD	1.3	1.1
Sex: Males	13	13
Females	3	3

In most cases parents and teachers cited factors such as poor academic progress and poor French comprehension as the primary reasons for the decision to transfer the children to the English program. However, in a small percentage of cases, emotional factors such as immature and dependent behaviour and school phobia were given as stronger reasons than the learning difficulty in motivating the transfer.

Method

Each child in the drop-out and control groups received an extensive battery of tests, which required one-and-one-half to two days for completion. In addition to the tests described in the first part of this section, achievement skills in French were assessed using the Test de Rendement en Français (1973, 1974), the French Comprehension Test, Level I (Barik 1976), and the French Peabody Picture Test, Forms A and B (translated versions of the Peabody Picture Vocabulary Test obtained from Dr. G. R. Tucker, McGill University, Montreal). In addition, each child received an extensive assessment of reading subskills (Doehring 1976).

Results

The drop-outs and controls could be classified into their appropriate groups at a highly significant level on the basis of different patterns of performance on the measures of the neuropsychological test battery. This accurate classification could be made not only statistically, but even clinically by simply looking at the test profile. The performance levels of controls and drop-outs on the various TPT measures were again compared. It was of considerable interest that there were no significant differences between the drop-outs and controls who were aged nine years or above; however, there were several significant differences between the drop-outs and controls who were below nine years of age. The finding of a significant psychomotor problem-solving deficit in the younger children that was no longer present in the older ones is of considerable importance and compatible with speculations put forth as a result of the initial study - namely, that children who perform poorly in early French immersion do so as a result of a maturational lag in the temporal-lobe regions. In the cross-validation study, the maturational lag is very apparent in the TPT profiles of children below age nine, but is no longer found in the children above age nine.

It should be noted that the teachers and parents tended to view the drop-outs as inattentive, restless, and difficult to manage - in fact, as having attributes often ascribed to hyperactive children. However, it must be recalled from the initial study that the neuropsychological test profile of the drop-out was significantly different from that of the actual hyperactive child. Further, the parents of drop-outs tended to rate their children as having behaviour problems and being tense. It is quite likely that such behaviour in these children was a result of being in a classroom in which they were not succeeding. As a result, they became restless, distractable, and difficult to manage. The likelihood that this was solely a situational reaction was further supported in the personality-test results, in which there was only one significant difference between the drop-outs and controls in the various personality tests. In fact both groups could be characterized as having normal personality-test profiles.

It seems clear that there are important neuropsychological test differences between groups of children who succeed when placed at a young age in an intensive second-language learning program as compared to children who fail. It is clearly of great importance to identify those particular children who would likely fail before they enter an early, intensive second-language learning program such as the Primary French-immersion program. If the maturational-lag hypothesis is correct, it also seems clear that these particular children should be educated in their native language first and enter an immersion program only after nine or ten years of age.

The finding of a unique pattern of deficits characteristic of children who experience difficulty in the Primary French-immersion program led this investigator to attempt to develop a battery of tests that could be administered to very young children (age four) that would be predictive of their ability to function well in a second-language immersion program. The next section presents the results of a three-year project designed to identify a set of variables predictive of success or failure in Primary French-immersion programs.

IV: Early-Identification Project

The Sample

Fifty-one of the principals of the fifty-three elementary schools in the Ottawa Board of Education offering an English four-year-old-Kindergarten program agreed to participate in the early-identification project. Teacher-rating forms and biographical and background information questionnaires were distributed to the teachers and parents of 1330 children in seventy-seven four-year-old-Kindergarten classes in the fifty-one schools.

A random half of the fifty-one participating schools were selected for participation in the three-year follow-up study. The area served by the Ottawa Board of Education was divided into grids based on geographical boundaries, and a random half of the schools located in each grid were selected. Parents who had indicated their intention to enrol their children in five-year-old French-immersion Kindergarten in September 1977 were sent letters requesting permission to have their children participate in the three-year early-identification project. Parents of children for whom French would be a third language were not contacted. Two hundred eligible subjects were obtained.

Procedure

Questionnaire data (four-year-old Kindergarten). The teachers of 1330 four-year-old-Kindergarten children in seventy-seven classes were asked to complete a brief rating scale for each child in their class. The teachers' ratings provided information not only about characteristics of four-year-old-Kindergarten children, but also about those characteristics held important by teachers in the selection of a school program.

Teachers distributed a questionnaire to the parents of all children in their four-year-old-Kindergarten classes. (These questionnaires were returned to the school.) The purpose of this questionnaire was to gather biographical and background information that may have been related to selection of a school program, to identify characteristics

of the child that parents considered important in program selection, and to provide a basis for assessing the representativeness or uniqueness of children enrolled in French-immersion Kindergarten. This questionnaire was concerned with characteristics of the children, of their parents, and of their homes. The factors assessed included age, sex, hand dominance, preschool experience, socio-economic status, number of books in the home, languages in the home, parental attitudes towards learning French, parents' reasons for choosing the regular English program or the French-immersion program for their children in five-year-old-Kindergarten, and characteristics parents considered to be important for success in French immersion.

Early-identification assessment battery. A variety of test measures and behaviour ratings were obtained for the sample of 200 children scheduled to enter five-year-old French-immersion Kindergarten in September 1977. The measures included five tests selected from CIRCUS: An Assessment Program for Pre-primary Children (1974). These tests assessed the children's knowledge of quantitative concepts such as counting, relational terms, and numerical concepts (CIRCUS 2: How Much and How Many); letter and numerical recognition and discrimination (CIRCUS 5: Finding Letters and Numbers); auditory discrimination (CIRCUS 7: How Words Sound); comprehension, interpretation, and recall of oral language (CIRCUS 9: Listen to the Story); and problem-solving (CIRCUS 13: Think It Through).

Each child was administered an individual test battery by a member of the research team. This battery consisted of the following ten psychometric tests, some of which were adapted specifically for this project: Wechsler Pre-School and Primary Scale of Intelligence (WPPSI) (Wechsler 1963); Peabody Picture Vocabulary Test, Form B (PPVT) (Dunn 1965); Raven's Colored Matrices, Board Form (Raven 1965); Wide Range Achievement Test (WRAT) (Jastak and Jastak 1965); Measure of Hand Dominance (Trites 1977); Tactual Performance Test (three-block board) (Trites and Price 1978); Color Naming (Trites and Price 1978); Word Segmentation

(adapted from Fox and Routh 1975); Renfrew Action Picture Test (Renfrew 1971); Test Behavior Observation Guide (Atwell, Orpet, and Meyers 1967); Conners' Teacher Questionnaire (Conners 1969); Pupil Rating Scale (Myklebust 1971).

Four-Year-Old-Kindergarten Study

Results. The results of the first year of the three-year investigation will be discussed in three parts. The first part presents the results of the teachers' ratings received from four-year-old-Kindergarten teachers of the Ottawa Board of Education. The results of the biographical and background information questionnaire distributed to the parents of the four-year-old-Kindergarten pupils are presented in the second part. The third part discusses the results of the early-identification assessment battery administered to 200 children who were to be enrolled in five-year-old French-immersion Kindergarten in September, 1977.

Teacher's ratings. Teachers of seventy-seven four-year-old-Kindergarten classes were asked to rate the 1330 children in these classes. The return rate was extremely high, with 1293 (97 percent) rating forms returned. Teachers were asked to rate the children in terms of their level of ability, social maturation, and motivation. They were also asked questions regarding the possibility of these children experiencing difficulty in school and the advisability of French-immersion enrolment for each child. It can be seen from Table 3 that, generally, it was the child who was rated highest on ability, social maturation, and motivation who was recommended by the teacher for the French-immersion program.

Table 3: Chi-square Analyses Comparing the Three Teachers' Enrolment Advice Groups on Teachers' Ratings of Ability, Social Maturation, and Motivation

		French Immersion Advised	French Immersion Not Advised	Undecided	Chi^2	df
Ability						
Below-average	#	0	107	3	85.83**	2
	%	0.0	20.3	4.9		
Average	#	162	316	42	11.52**	2
	%	44.5	60.0	68.9		
Above-average	#	202	104	16	82.96**	2
	%	55.5	19.7	26.2		
Statistical analysis		Chi^2 = 173.64** (df = 4)				
Social Maturation						
Below-average	#	25	196	11	82.24**	2
	%	6.8	36.8	18.0		
Average	#	202	297	47	5.32	2
	%	55.3	55.8	77.0		
Above-average	#	138	39	3	112.03**	2
	%	37.8	7.3	4.9		
Statistical analysis		Chi^2 = 199.74** (df = 4)				
Motivation						
Below-average	#	3	127	5	81.74**	2
	%	0.8	24.0	8.2		
Average	#	197	339	49	7.45*	2
	%	54.3	64.0	80.3		
Above-average	#	163	64	7	99.3**	2
	%	44.9	12.1	11.5		
Statistical analysis		Chi^2 = 189.45** (df = 4)				

*$p < .05$
**$p < .01$

French-immersion enrolment versus English-program enrolment. Based on information gained from the biographical and background information questionnaire and the teachers' ratings, a number of differences were found between children who were to enter the French program and those who were to enter the English program. There were no age differences between the two groups, but there was a slight tendency for a greater number of females to be enrolled in French immersion. There were significant socio-economic-status (SES) differences. The SES of fathers, mothers, and families of the French-immersion group were significantly higher than those of the English-program group. The mean SES for fathers and for the family of the French-immersion group was in the lower-upper-class range, compared with the upper-middle SES range for the English-program fathers and families. The mothers of the French-immersion-program group had a mean SES level in the upper-middle-class range, compared with the lower-middle-class SES level of the mothers of the English-program group.

There was evidence from the responses to the parent questionnaire that parents who enrol their children in French immersion are themselves more interested in speaking French than are parents who choose the English program, and in fact many of them were taking or had taken a French-language-instruction course.

When children in the French-immersion- and English-program groups were compared on the basis of the "below-average", "average", or "above-average" teacher ratings of their ability, social maturation, and motivation, it was found that significantly more children in the English-program group received "below-average" ratings compared with the French-immersion group. In addition, significantly more children in the French-immersion group received "above-average" ratings of ability compared to the English-program group. This pattern of responses suggests that parents are sensitive to these characteristics in their children, so that a child who is "below-average" in ability, social maturation, and motivation is more likely to be enrolled in the English program.

In terms of teachers' predictions of difficulty in school, significantly more children in the English-program group were rated as "likely" to have difficulty in school compared with the French-immersion group.

Teachers' ratings of these children indicate some interesting differences between the children who enter these two school programs. The English program tends to receive more children who are rated by teachers as "below-average" in ability, fewer children who are rated as "above-average" in ability, and more children who are likely to encounter difficulty in school. The French-immersion program thus appears to be composed of the most capable students.

Early-identification assessment battery. Mean scores and standard deviations obtained on the 200 children in the French-immersion sample on a few selected measures of the assessment battery are presented in Table 4.

Table 4: Means and Standard Deviations Obtained by the Sample of 200 Children to be Enrolled in French Immersion on Selected Measures of the Early-Identification Assessment Battery

Variables		$\bar{X}$	SD
Age		4.9	0.3
WPPSI : VIQ		118.3	12.4
PIQ		115.8	12.0
FSIQ:		118.9	11.9
Peabody: MA		6.2	1.3
IQ		114.0	14.3
Matrices Raw		17.3	4.6
Percentile		79.7	21.9
WRAT: Grade:	Reading	1.05	0.4
	Spelling	0.51	0.4
	Arithmetic	0.80	0.4

As a group, the 200 children tended to perform well on all measures. Average scores on the WPPSI were in the bright-normal range and language skills were well developed. Readiness skills for reading were

at the Grade 1 level, while spelling and arithmetic readiness skills were at the mid to late five-year-old-Kindergarten level. Thus, in general, this group was composed of very capable youngsters who were rated highly by their teachers and performed well in the testing situation.

Summary. The sample of children who were scheduled to be enrolled in five-year-old French immersion performed very well on the measures of the early-identification assessment battery. IQ scores were in the bright-normal to superior range. Ratings of behaviour by research staff and by four-year-old-Kindergarten teachers did not indicate specific areas of difficulty for this group as a whole. The average mental-age score was well above the four-year-old level at six years and two months, (Peabody) . Expressive language skills were within the five-and-a-half-to-six-year range in terms of information, and within the five-to-five-and-a-half-year range for grammar (Renfrew) . Tests of other skill areas also resulted in competent performance levels.

Teachers tended to advise against French immersion for children whom they rated "below-average" in terms of ability and social maturation. For children of "average" to "above-average" ability, teachers were cautious about advising French immersion if the child's level of social maturation or motivation was rated "below-average". These findings are consistent with the results reported earlier: teachers give high priority to a child's general development, especially maturity and emotional/social adjustment, when advising against French-immersion enrolment.

Parents and teachers were unanimous in recommending French-immersion enrolment for a group of children that stood out in terms of high scores on performance IQ measures and advanced receptive vocabulary; above-average competency, as rated by teachers, in terms of auditory comprehension, spoken language, and motor co-ordination; superiority in performance rate and manual dexterity, as rated by research staff;

and advanced readiness skills in the areas of identification of letters and numbers, auditory discrimination and problem-solving. Those children whose parents decided in favour of French-immersion enrolment contrary to their teachers' advice performed more poorly than the previously mentioned group on the above measures as well as on the form-board task, expressive language skills, colour naming, and readiness skills for reading, spelling, and arithmetic. This group also had more behaviour problems and less competency as rated by teachers and research staff.

Conclusion. The first phase of the early-identification project investigated various descriptive variables, with extensive test data collected for a sample of children whose progress in school would be followed for two years. The results indicated that there were describable patterns of differences at many levels for children entering different Kindergarten programs (French immersion versus the regular English program) and among children entering French immersion. The demographic data, parent ratings, teacher ratings, and early-identification-test information were all assessed in the next two years (the findings are reported in the following two parts of this section) for their effectiveness as predictors of success in the French-immersion program.

Five-Year-Old-Kindergarten Study

Results. One hundred and eighty-four of the 200 children assessed in the spring of the four-year-old-Kindergarten year (1977) were re-assessed in the spring of the five-year-old-Kindergarten year (1978). One hundred and fifty-nine of these children were enrolled in a five-year-old French-immersion Kindergarten program at the time of the Kindergarten follow-up assessment.

Parents of eleven children had opted for a regular five-year-old Kindergarten because they felt that their children were not ready for French immersion, or because it was not conveniently available. Six

children had been transferred from the French-immersion program to an English program during the five-year-old-Kindergarten year. In most cases parents did not make this decision on the basis of the particular learning difficulties encountered by each child, but rather on the basis of dissatisfaction with the situation of bussing or with specific aspects of the school program (e.g., in their opinion a lack of creativity, a lack of emphasis on basic skills, a lack of materials).

Seven children were enrolled in a bilingual program. Parents had opted for this program because it offered additional support in the English language and/or it was located in a neighbourhood school.

Parents tended to express positive attitudes towards the French-immersion program. The majority of parents (n = 103) had no concerns about the program. Although the parents of twenty-six children intended to enrol their children in an English Grade 1 program and parents of three children opted for a bilingual Grade 1 program, most of these parents considered the possibility of enrolment in French immersion in the future. This indicated a positive attitude towards the goal of having children learn French during the early grades.

The four Kindergarten enrolment groups were compared in terms of the information obtained in the initial and follow-up assessments.

Of considerable importance was the fact that the ratings of the four-year-old-Kindergarten teachers did not discriminate significantly among the four Kindergarten enrolment groups (transfers to English program; transfers to bilingual program; French immersion; and English Kindergarten - no French immersion). However, children who had transferred to the English program tended to have received a greater proportion of low ratings in ability.

Five-year-old-Kindergarten teachers did not recommend French-immersion enrolment for nineteen children (12 per cent) who completed the five-year-old French-immersion Kindergarten program. Thus, these children

appeared to have encountered substantial difficulty in the program. The reasons cited by the teachers when advising for or against French-immersion enrolment, were examined. While teachers considered a child's ability level to be important when advising against French-immersion enrolment, a child's level of maturity was considered to be highly important as well. The child's ability level was cited most frequently when French immersion was advised. These findings are similar to the results reported previously (Trites and Price 1978). Four-year-old-Kindergarten teachers were found to emphasize the child's social and emotional development when advising against French immersion, and they considered the level of ability to be of greatest importance when making the decision to advise French-immersion enrolment. However, they were not able to make accurate predictions using these criteria.

Teachers' reports of difficulty in Kindergarten indicated that approximately half of the children in the English program, half of the transfers, and one-third of the children in French immersion experienced difficulty. The main reason for difficulty was a combination of immaturity and emotional-social adjustment problems. Thus, a child's level of emotional and social adjustment is an important factor associated with progress in the five-year-old French-immersion Kindergarten program as judged by Kindergarten teachers.

The four Kindergarten enrolment groups were compared on the measures of the early-identification assessment battery. On the whole, children enrolled in the bilingual program had higher IQ scores and performed well on all of the tests administered. The children who had enrolled in the regular English program and the children who transferred to the English program tended to have lower IQ scores than those of the other two groups, although they were within the average to high-average range, and to have generally lower scores on the variables of the early-identification assessment battery.

Few significant group differences were found on the measures of the Kindergarten follow-up assessment battery. The transfers fared less well than the others, perhaps as a result of adjusting to two school programs during the school year.

The 159 children who were in French-immersion Kindergarten in the spring of 1978 were considered in detail to determine the predictive validity of measures obtained in the spring of 1977. A statistical analysis was performed on thirty-five predictor variables of the early-identification assessment battery and eleven criterion variables of the Kindergarten follow-up assessment battery. Better prediction was accomplished for measures of English-language achievement than for measures of French-language achievement. The best prediction was found for the Wide Range Achievement Test (WRAT) reading percentile score. Prediction of achievement in French and English was related to similar measures, including colour- and picture-naming in English, readiness measures of quantitative concepts and knowledge of letters and numbers, WRAT arithmetic scores, expressive language skills in English, and behaviour ratings by research staff and teachers. It is interesting to note that academic achievement in reading, spelling, and arithmetic measured in English was best predicted by IQ. IQ was of greater importance when predicting achievement on measures in the English language than when predicting achievement in French. Of great interest, Tactual Performance Test scores entered into multiple-regression equations for French-language measures but not for English-language measures.

Although much of the variance was left unaccounted for in the evaluations of the predictive validity of four-year-old-Kindergarten measures, the relationships established at the five-year-old-Kindergarten level were encouraging. Much more variation in academic progress was expected to be evident in the Grade 1 program, where structured learning situations are more demanding. Thus, it was expected that the measures obtained at the end of four-year-old and five-year-old Kindergarten would have greater predictive validity when they were assessed against criterion measures obtained in the spring of Grade 1.

Further encouraging results with regard to the prediction of achievement in French immersion were found in the comparisons of groups of high and low achievers formed on the basis of percentile scores on the French comprehension test. As can be seen from Table 5, important differences were found between these groups on measures of the early-identification assessment battery and of the Kindergarten follow-up assessment battery. Low achievers were younger, had lower IQ scores, had lower scores on the Tactual Performance Test, and were generally less prepared for a Kindergarten program than were high achievers when they were assessed at the end of four-year-old Kindergarten. At the end of five-year-old French-immersion Kindergarten, high achievers outperformed low achievers on several measures, including achievement in French, readiness skills of listening comprehension and problem-solving, and English grammar skills.

Table 5: Means, Standard Deviations, and T-scores for Significant T-test Comparisons of High and Low Achievers on the Early Identification Assessment Battery

	High Achievers		Low Achievers			
	$\bar{X}$	SD	$\bar{X}$	SD	T-SCORE	df
Age	5.0	0.3	4.8	0.3	2.52*	65.4
WPPSI VIQ	124.4	12.4	116.2	11.1	2.89**	66.0
FSIQ	123.8	11.4	117.9	10.7	2.20**	65.8
Matrices Raw score	18.6	5.9	15.9	4.0	2.20*	62.3
WRAT Arithmetic Grade score	1.0	0.4	0.8	0.4	2.19*	64.3
Formboard: ▲						
Total time	97.5	1.2	96.7	1.7	2.31*	65
Non-dominant time	99.2	0.6	98.8	1.0	2.27*	65
Time per block-(Nondom)	33.1	0.2	32.9	0.3	2.21*	65
Colour-naming	9.7	0.6	8.8	1.5	3.29**	66
Word Segmenting:						
Total segmented	14.6	3.1	12.0	5.4	2.41*	66
Total (syllables)	10.3	3.2	7.7	3.7	3.08**	62.4
Observer's Checklist:						
E: Attention	5.4	1.5	4.6	1.9	2.07*	60.2
Renfrew: Information	26.5	2.6	23.7	3.6	3.68**	66
Grammar	28.6	5.3	26.4	3.4	2.06*	66
Conners Teacher Rating:+						
Inattentive-passive	13.3	17.2	23.6	19.2	-2.33*	62.6
Myklebust Pupil Rating Scale:						
Auditory Comprehension	14.2	3.2	12.4	2.3	2.77**	63
Spoken Language	17.4	3.2	15.5	2.8	2.54*	66
CIRCUS						
# 2: How Much & How Many	32.8	4.4	29.1	5.7	2.98**	57.5
# 5: Finding Letters and Numbers	18.2	1.6	16.6	3.7	2.25*	66
# 7: How Words Sound	40.4	3.1	38.6	3.3	2.36*	63.9
# 9: Listen to the Story	18.3	2.7	15.8	3.3	3.36**	59.8
#13: Think it Through	22.6	3.9	18.9	4.1	3.72**	64.2

▲ Higher scores represent better performance.
\+ Higher scores indicate a greater incidence of problems.
* $P < .05$.
** $P < .01$.

An important finding in the comparisons of high and low achievers on the French comprehension test arose from an analysis of the advice of the four- and five-year-old Kindergarten teachers regarding French-immersion enrolment. At both grade levels, the teachers' advice was not strongly related to achievement on the French comprehension test at the end of five-year-old French-immersion Kindergarten. Four-year-old-Kindergarten teachers advised French-immersion enrolment for 74 per cent of low achievers and five-year-old-Kindergarten teachers advised enrolment for 77 per cent of low achievers. This finding is a further indication that the informal selection procedures applied to decisions regarding French-immersion enrolment need to be validated. The evidence from the present study suggests that teachers' advice is not a reliable selection procedure and that screening measures need to be validated as predictors of success or failure in the French-immersion program.

The early-identification test battery seems to have considerable promise. Significant differences found among groups of children enrolled in various Kindergarten programs, among high achievers and low achievers on the French comprehension test, and among various achievement groups formed on the basis of teacher ratings at the end of five-year-old French-immersion Kindergarten indicated that measures obtained in four-year-old-Kindergarten were related to subsequent achievement in the second-language-immersion program. Correlational analyses and multiple-linear-regression analyses also pointed to relationships between predictor and criterion variables.

In the last part of this section, the predictive validity of the early-identification assessment battery administered in four-year-old Kindergarten will be assessed in the light of achievement in French and English in the Grade 1 French-immersion program. The greater academic demands of the Grade 1 program, in contrast to Kindergarten, may result in greater variability in achievement, and outcomes at this level might better validate the predictive value of earlier measures. In addition, the predictive validity of the Kindergarten follow-up assessment battery was assessed in terms of achievement in the Grade 1 program.

The preliminary follow-up indicates that a set of variables predictive of success or failure in Primary French immersion will be validated. If so, it will be possible to present guidelines for identifying the child who is able to be successfully immersed in a second-language learning program at an early age.

Grade 1 Study

Results. In the first phase of this project, measures were obtained for children in the spring of their English four-year-old-Kindergarten program prior to enrolment in a Primary French-immersion program. In the second phase, the predictive validity of the measures obtained in four-year-old Kindergarten was assessed in terms of criterion measures of academic achievement in English and French obtained in the spring of five-year-old French-immersion Kindergarten. Additional measures of psychomotor problem-solving ability and readiness skills of listening comprehension and problem-solving were also obtained in the second phase to be evaluated as predictors of future achievement in the Grade 1 program. In the third phase, the predictive validity of the variables obtained in the four- and five-year-old-Kindergarten evaluations was assessed in terms of criterion measures of achievement in English and French in the spring of the Grade 1 program.

At the end of Grade 1, 169 of the initial 200 children were located and assessed. A total of 124 children were still in French immersion, while most of the remainder were in an English program. Twenty-five of the children in the English program were clearly established as drop-outs from the French-immersion program on the basis of academic factors. It must be stressed that the recommendation that the child transfer from the French to the English program was usually made by the teacher or other school personnel and that at no time were the results of the testing from this project made available to either the parents or the school authorities.

Comparisons of drop-outs and the French immersion group. The 124 children who attended the French-immersion program to the end of the Grade 1 year and the 25 children who dropped out of French immersion were similar in terms of family socio-economic status (lower-upper-class range), sex (there were fairly equal distributions of boys and girls), and preschool experience. Both groups were from advantaged home backgrounds. Parents of both groups expressed a predominantly integrative orientation in terms of their reasons for enrolling their children in French immersion. Parents' attitudes towards the French language and its speakers were positive.

The reliability of the recommendations of four- and five-year-old-Kindergarten teachers with regard to French-immersion enrolment as predictors of which children would drop out of the program were examined. The results indicate that the advice of the four- and five-year-old-Kindergarten teachers did not reliably predict which children would drop out of the French-immersion program.

Four-year-old-Kindergarten teachers rated the children in terms of ability, social maturation, and motivation prior to their enrolment in French-immersion five-year-old Kindergarten. The French-immersion and drop-out groups did not differ significantly on these scales. Thus, one cannot predict which children are likely to drop out of a Primary French-immersion program on the basis of these ratings by four-year-old-Kindergarten teachers.

The comparisons of the French-immersion group and the drop-outs on the early-identification assessment battery presented in Table 6 indicated that the French-immersion group had higher IQ scores. However, the drop-outs were within the bright-normal range of intelligence and capable of good progress in school. Although the French-immersion group had higher scores on the WRAT reading and arithmetic measures, both groups scored at least six months in advance of the four-year-old-Kindergarten level. With regard to CIRCUS readiness measures, the French-immersion group out-performed the drop-outs and were better prepared for the five-year-old-Kindergarten program. When IQ differences were controlled

Table 6: Means, Standard Deviations, and Significant T-test Comparisons of the French-Immersion Group and Drop-outs on the Early-Identification Assessment Battery

	French Immersion		Drop-outs		
	$\bar{X}$	SD	$\bar{X}$	SD	t-prob
	n = 124		n = 25		
WPPSI:					
VIQ	120.6	11.7	114.5	12.8	.035
PIQ	116.9	12.0	111.6	12.0	.050
FSIQ	120.7	11.5	114.6	11.8	.022
Vocabulary	13.6	2.5	12.2	2.5	.020
Arithmetic	13.3	2.5	11.8	1.0	.002
Sentences	10.7	2.7	8.9	3.3	.016
Picture completion	13.2	2.5	11.9	2.7	.035
WRAT					
Reading grade	1.1	0.4	0.9	0.3	.004
Arithmetic grade	0.9	0.4	0.6	0.4	.000
Colour-naming	9.4	1.0	8.9	2.2	.050
Word segmenting:					
Total	13.8	4.0	10.7	6.3	.002
Syllables	9.6	3.7	7.1	4.6	.018
Observer's checklist:					
C: Manual dexterity	5.4	1.4	4.7	1.2	.024
Renfrew:					
Information	25.7	3.4	23.6	3.5	.011
Myklebust:					
Auditory comprehension	13.5	2.8	12.3	2.1	.019
Verbal	29.9	5.4	27.7	4.9	.044
Total	77.7	12.4	73.0	9.1	.032
CIRCUS:					
2: How much and how many	32.1	4.2	28.3	4.7	.001
5: Finding letters and numbers	17.7	2.4	16.0	3.7	.004
7: How words sound	40.4	2.8	37.7	3.6	.001
9: Listen to the story	18.0	3.1	15.7	3.7	.005
13: Think it through	21.5	4.4	18.9	4.5	.013
Tactual Performance Test:					
Dominant time per block	32.8	0.8	33.6	3.0	.020

statistically in analyses of co-variance, the drop-outs continued to differ significantly from the French-immersion group on CIRCUS readiness measures. However, the drop-outs were not deficient in terms of readiness skills and were well able to cope with the demands of a regular Kindergarten program. The poorer performance of the drop-outs on readiness measures reflecting language skills - namely, listening comprehension and auditory discrimination - suggest that children with better English-language skills in four-year-old Kindergarten were less likely to drop out of French immersion.

The significantly better performance of the French-immersion group on the Tactual Performance Test (dominant hand time per block), even when full-scale IQ was controlled statistically, was consistent with the findings of previous investigations of children encountering difficulty in French immersion and of drop-outs from the French-immersion program (Trites and Price 1976, 1977). Again, the drop-outs performed more poorly on this measure in comparison with the children in the French-immersion program. This finding was consistent with the maturational-lag hypothesis proposed in the earlier studies.

The drop-outs lagged behind the French-immersion group in all areas of achievement in French assessed in Grade 1. At the Grade 1 level, the drop-outs outperformed children who continued in French immersion on WRAT measures of reading and spelling in English. Thus, the drop-outs responded well to instruction in the English language and made progress.

Comparisons of drop-outs, low achievers, and high achievers in French immersion. Once it was established that, based on the four-year-old-Kindergarten assessment, it was possible to differentiate, at highly accurate levels, between those children who would still be in French immersion by the end of Grade 1 and those who would have dropped out, it was decided to further subdivide the 124 children who were still in French immersion into high achievers and low achievers, on the basis of both teacher assessments and a variety of French-language test results.

A detailed discussion of the SES, preschool experience, teacher assessments, parent-questionnaire information, and related factors for the drop-outs, low achievers, and high achievers is available (Trites and Price 1980). This section will be primarily concerned with the test results.

The extent to which the drop-outs could be discriminated from the high achievers and low achievers in French immersion on the basis of predictive data gathered in four- and five-year-old Kindergarten was assessed in stepwise multiple-discriminant-function analyses. The drop-outs and high achievers were easily separated. The children in these groups were classified correctly into their groups with 100 per cent accuracy on the basis of the early-identification assessment battery (four-year-old Kindergarten) and also on the basis of the five-year-old-Kindergarten follow-up assessment battery. At the four-year-old-Kindergarten level, univariate analyses of variance yielded significant differences between the high achievers and the drop-outs on measures of IQ; readiness skills including quantitative concepts, knowledge of letters and numbers, auditory discrimination, and problem-solving; WRAT, spelling test scores; ability to segment words into syllables; levels of manual dexterity, self-confidence, co-operation, and interest observed during the four-year-old-Kindergarten assessment; level of inattentive-passive behaviour as rated by teachers; and teacher ratings of auditory comprehension, spoken language, and personal-social behaviour. The high achievers obtained better scores than the drop-outs on all of these measures. Of the above measures, the highest weights in the discriminant function were given to inattentive-passive behaviour, knowledge of letters and numbers, interest, spoken language, auditory comprehension, problem-solving, auditory discrimination, and quantitative concepts. However, other measures were given high weights in the discriminant function, although the group differences were not significant. These included attention, anxiety, picture-naming, colour-naming, and the Tactual Performance Test. Thus, if one were to

administer fourteen tests of the early-identification assessment battery to children at the end of four-year-old Kindergarten, to gather socio-economic status information, and to have the children rated by their teachers on the Conners Teacher's Questionnaire and the Myklebust Pupil Rating Scale and also by the examiners on the Observers' Checklist, one could predict with extreme accuracy those children who were likely to encounter difficulty in a Primary French-immersion program and drop out of the program, and those who were likely to progress very satisfactorily in the French-immersion program. The fourteen test measures would include IQ, CIRCUS readiness tests, the Tactual Performance Test, picture- and colour-naming, the WRAT spelling test, word-segmentation, and the Renfrew Action Picture Test.

At the five-year-old-Kindergarten level, the drop-outs and high achievers differed significantly on fourteen of the sixteen variables included in the discriminant function. The high achievers had better expressive and receptive language skills in English; better performance on the Tactual Performance Test; better academic achievement in English reading, spelling, and arithmetic; better knowledge of numbers, letters, and object names in French; better listening comprehension in English; and higher ratings of performance rate and manual dexterity. Of these measures, the highest weights in the discriminant function were given to knowledge of object names in French, manual dexterity, reading, arithmetic, and spelling grade scores, performance rate, and the Tactual Performance Test. Thus, at the five-year-old-Kindergarten level, one can accurately predict drop-outs and high achievers on the basis of twelve tests of the Kindergarten follow-up assessment battery, together with age, teachers' ratings of hyperactivity (Conners), and the Observers' Checklist. The tests of importance from the five-year-old-Kindergarten test battery were the Peabody Picture Vocabulary Test, Renfrew Action Picture Test, Tactual Performance Test, WRAT, knowledge of object names, numbers, and the alphabet in French, and the CIRCUS test of listening comprehension in English (# 9).

Thus, one can separate drop-outs and high achievers on the basis of both the early-identification assessment battery and the five-year-old-Kindergarten follow-up assessment battery. An important finding of these discriminant function analyses was the role of the Tactual Performance Test in separating drop-outs and high achievers. In the studies reported in section III, it was found that children who encountered difficulty in French immersion had a unique pattern of skills and deficits characterized by a high IQ and excellent motor and sensory functions and yet poor performance on the Tactual Performance Test (a complex psychomotor problem-solving task). The findings were interpreted as evidence of a maturational lag in the temporal-lobe regions of the brain. In the cross-validation study, children who dropped out of French immersion performed more poorly on the Tactual Performance Test than children who remained in the program and were doing well. Again, drop-outs performed more poorly on the Tactual Performance Test. The difference was statistically significant in younger children (below age nine), but, consistent with a maturational-lag hypothesis, the differences had disappeared in the above-age-nine group, although the trend was still in favour of the control group. In the study reported here, the Tactual Performance Test was selected by the stepwise procedure for inclusion in the discriminant function separating drop-outs and high achievers at both the four-year-old- and five-year-old-Kindergarten levels. The group differences were significant at the five-year-old-Kindergarten level, and the Tactual Performance Test scores were given fairly high weights in the discriminant function at both levels. The lack of significant group differences on the Tactual Performance Test measure in four-year-old Kindergarten may be related to the nature of this test. To accommodate the special circumstances in testing four-year-olds, the Tactual Performance Test was modified. The children were required to place only three blocks (circle, square, and triangle) in spaces arranged in a horizontal row on a board. Thus, compared to the six-block board used at the five-year-old-Kindergarten level, the four-year-old-Kindergarten measure did not allow for as much variation in performance and the task was much less difficult. The

Tactual Performance Test at the four-year-old-Kindergarten level was thus different from the tasks used in the previous studies (Trites and Price 1976, 1977), which indicated significant group differences, and also from the task at the five-year-old-Kindergarten level, which also indicated significant group differences. The role of the Tactual Performance Test in the present follow-up of children entering Primary French-immersion programs is consistent with the hypothesis of a maturational lag in the temporal-lobe regions of the brain for children who are unable to make satisfactory progress in Primary French immersion.

High levels of correct classification were also obtained in the discriminant-function analyses of the drop-outs versus low achievers. Based on the early-identification assessment battery (four-year-old Kindergarten), 88 per cent of the children were correctly classified according to group. Based on the five-year-old-Kindergarten follow-up assessment battery, 91 per cent were correctly classified according to group. At both Kindergarten levels, the only significant difference between the drop-outs and the low achievers was in terms of age, with the drop-outs being slightly older. However, on the basis of four-year-old-Kindergarten measures, correct classification was made on the basis of twenty-one variables included in the discriminant function. High weights on the discriminant function were given to ratings of anxiety and motor activity, co-operation, conduct problems, and spoken language, to age, picture-naming, auditory comprehension, SES, and listening comprehension skills. Thus, age, SES, teachers' ratings (Conners and Myklebust scales), the Observers' Checklist, and tests of IQ, academic achievement, picture- and colour-naming, word-segmenting, listening comprehension in English CIRCUS #9), and the Renfrew Action Picture Test yielded a good separation between drop-outs and low achievers.

At the five-year-old-Kindergarten level, sixteen measures from the Kindergarten follow-up assessment battery were selected to discriminate drop-outs and low achievers. The highest weights on the discriminant function were given to Renfrew grammar and information scores, speech

fluency in English, picture-naming, listening comprehension, effort, and age. At the five-year-old-Kindergarten level, one can separate drop-outs from low achievers on the basis of age, SES, the Peabody Picture Vocabulary Test, the Renfrew Action Picture Test, the Tactual Performance Test (memory, location, and total time per block), picture-naming in French, knowledge of the alphabet in French, listening comprehension and problem-solving skills (CIRCUS #9, #13),the Observers' Checklist, and teacher ratings of tension-anxiety (Conners). Performance levels on the two groups varied on these measures. The drop-outs tended to have higher receptive vocabulary skills in English, and higher English-grammar scores.

On the basis of the information gathered in four-year-old Kindergarten, including the biographical and background information questionnaire, teachers' ratings, and the early-identification assessment battery, the following picture of the future drop-out from the French-immersion program emerges. The drop-out has bright-normal intelligence. Four-year-old-Kindergarten teachers rate the drop-out as average or above-average in ability, and as average in social maturation and motivation. The drop-out may be a boy or a girl, and is likely to have attended preschool. He or she comes from an advantaged lower-upper-class home. His or her parents have positive attitudes towards French immersion, the French language, and its speakers. His or her four-year-old-Kindergarten teacher may have advised that he or she be enrolled in French immersion. However, if the five-year-old-Kindergarten teacher advises against French-immersion enrolment, it is highly likely that the child will encounter difficulty in the French-immersion program. The drop-out tends to have poor auditory discrimination skills and receive low ratings on auditory comprehension and spoken language. The drop-out lags behind his or her peers in terms of knowledge of basic concepts of numbers and letters, quantitative concepts, and colours. The drop-out is less flexible in terms of problem-solving, both manually (Tactual Performance Test) and verbally (word segmenting, CIRCUS #13). The drop-out is less adept in manipulative skills as indicated by poorer performance on the WRAT spelling subtest, which

involves copying marks, poorer performance on the Tactual Performance Test, and lower ratings of manual dexterity. Despite these lower performance levels, drop-outs make good progress in acquiring reading, spelling, and arithmetic skills in English, and have well-developed receptive and expressive language skills in English, indicating that their learning difficulties are specific to the second language only.

V: Summary and Recommendations

The five studies summarized in this monograph have aimed at furthering our understanding of the effects of second-language immersion on young children. The results of the first year of study demonstrated clearly that the neuropsychological test profile of children who are unable to make satisfactory progress when immersed in a second-language program beginning in five-year-old Kindergarten is substantially different from that of children who have the more "traditional" type of learning disabilities such as primary reading disability, emotional disturbance with learning difficulty, hyperactivity with learning difficulty, or minimal cerebral dysfunction with learning difficulty. In addition, it was most interesting to see that the learning-disability profile in the immersion group was distinguishable from those of Francophone children failing in Francophone programs, Anglophone children failing in a Francophone school, and children from other ethnic backgrounds failing in an English-language program. It was possible, based on the first year of study, to tentatively propose that children who fail when placed in a Primary French-immersion program appear to have a maturational lag in the temporal-lobe regions of the brain. The temporal lobes are important brain structures for auditory perceptual abilities as well as for verbal and non-verbal perceptual and memory functions.

The second study, conducted a year later, was designed to see if the results of the first year of investigation could be validated. The second study not only completely replicated the results first noted, but also further clarified the maturational-lag hypothesis by demonstrating that the neuropsychological deficits were apparent in children below nine years of age but were no longer found in those over that age. Presumably children who have evidence of the specific maturational lag and are not able to progress satisfactorily when immersed in a second-language program in five-year-old Kindergarten would be able to make completely satisfactory progress if immersed at Grade 3 or 4, or later. Follow-up studies of children who had been transferred to an English-language program from French immersion due to academic difficulties indicated that the children progressed rapidly in the development of English language arts skills.

The first two years of study suggested that it may be possible to develop an early-identification battery that could be administered to four-year-old children and that would be predictive of their ability to progress satisfactorily in a French-immersion program beginning in five-year-old Kindergarten. A large representative sample of four-year-old children was assessed at the end of their four-year-old-Kindergarten school year. They were tested individually on selected measures, and extensive teacher-observation information and questionnaire data from parents were obtained. Follow-up assessments were obtained at the end of five-year-old Kindergarten and at the end of Grade 1 for both those children who remained in the French-immersion program and the children who were transferred out of the program for a variety of academic, behavioural, and other reasons. Results from the three years of investigation indicated that it was possible to identify with 100 per cent accuracy, based on the four-year-old assessment, the children who would drop out of French immersion for academic reasons as opposed to those children who were to remain in the program and do very well. It was even possible to identify with 80 to 90 per cent accuracy the drop-outs as opposed to those children who would remain in the French-immersion program in spite of experiencing academic difficulties. The best predictors were the individual neuro-psychological measures, several of which were specifically designed for the early-identification assessment. The test findings supported the interpretation given to the first two years of investigation - namely, that there are certain children who, in spite of being bright, highly motivated, from advantaged socio-economic background, and free from personality or neurological impairment, have a mild maturational lag, which is easily identified as early as four years of age. These particular children progress normally when they are educated in the vernacular, but are unable to progress satisfactorily in a second-language-immersion program.

The early-identification battery for four- and five-year-old children appears to hold considerable promise and may be useful in a variety of

ways. So far, it has been possible, through the use of a small number of tests, to differentiate within a group of children who have bright-normal abilities and come from advantaged socio-economic backgrounds those who: (a) will do well in Primary French immersion; (b) will be able to remain in the program, at least to the end of Grade 1, in spite of doing poorly; and (c) will drop out for academic reasons on the recommendation of the school. It would seem important to determine whether the same test battery can make similar differentiations among four-year-old children with varying levels of ability. For example, it is very likely that among children of average and below-average ability some will have evidence of a specific maturational lag while others will not, and presumably this differentiation can be made on the basis of the early-identification battery described in this report. It is predicted that the latter group would do well in Primary French immersion in spite of having average or below-average intelligence.

Most of the measures in the early-identification battery can easily be administered in French. Presumably the same proportion of Francophone children have a maturational lag and should not be considered for immersion in an English-language program at the five-year-old-Kindergarten, Grade 1, or Grade 2 level. The screening battery might be very useful in this population of children as well.

Increasing numbers of immigrant children are being educated in Canadian schools. Presumably a significant proportion of these children are severely handicapped educationally when they are placed in an English-language program (even in a specialized English-as-a-second-language program) if they have a maturational lag of the type described here. The children could be identified on the early-identification battery and, if feasible, educated in their native language first.

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